

1 In the claims:

2 1. A system for using a printed document encoded with a message,
3 comprising:

4 a movable image sensor that collects images of portions of the printed document,
5 each portion being encoded with (1) an absolute location within the printed document and
6 (2) a fragment of the message, wherein a known mapping exists between the position of
7 each fragment and the corresponding absolute location; and

8 an image analyzer coupled to the image sensor to determine relative motion of the
9 image sensor and extract absolute locations and fragments of the message from the
10 images, wherein the image analyzer extracts the message from the fragments using the
11 known mapping.

12 2. The system as recited in claim 1, wherein the message is of variable size.

13 3. The system as recited in claim 1, wherein the image analyzer determines
14 the relative motion of the image sensor by measuring changes in successive images such
15 that the relative motion can still be extracted even when the image sensor is not over the
16 printed document.

17 4. The system as recited in claim 1, wherein the printed document is selected
18 from a group comprising a map, a calendar page, a catalog, a customer list, and an index.

19 5. The system as recited in claim 1, further comprising a computing module
20 that performs a predefined action in response to the extracted message and at least one of
21 (1) the relative motion of the image sensor and (2) the absolute locations within the
22 printed document.

23 6. The system as recited in claim 5, wherein the predefined action is selected
24 from at least one of the following:

25 retrieving information from an information store;

26 changing the internal state of the computing module;

27 storing information in an information store; and

28 retrieving and executing a macro, wherein the macro comprises a sequence of
29 processing instructions which uses at least one of the absolute locations, the relative
30 location, and the internal state of the computing device.

7. The system as recited in claim 5, wherein the encoded message further comprises security information, and wherein the predefined action is authenticated using the security information before being performed.

8. The system as recited in claim 5, further comprising at least one output device for showing results or side-effects of performing the predefined action, wherein each of the at least one output device is one of a type selected from the group consisting of a printer, visual display, audio device, audio-visual device, and multi-media device.

9. The system as recited in claim 8, wherein at least one output device is a visual display, and the image sensor and visual display are integrated as one physical unit, thereby allowing the display to appear as a window over the printed document.

10. The system as recited in claim 9, wherein each pixel on the visual display is either transparent or opaque, and computer-controlled.

11. The system as recited in claim 8, wherein at least one output device is a print-head, and the image sensor and print-head are integrated as one physical unit, thereby allowing the print-head to leave marks, under computer control, on a surface being scanned by the image sensor.

12. The system as recited in claim 5, wherein a zoom factor is used to modify the relative motion of the image sensor.

13. The system as recited in claim 5, further comprising a user interface in communication with the computing module, wherein the user interface is used to select or modify the predefined action to be performed in response to the extracted message and at least one of (1) the relative motion of the image sensor and (2) the absolute locations within the printed document.

14. The system as recited in claim 5, wherein the predefined action depends on at least one of an identity of the image sensor, an identity of the computing module, and an identity of a human holding the image sensor.

15. A system for using a printed document encoded with a message, comprising:

a movable image sensor that collects images of portions of the printed document, each portion being encoded with (1) an absolute location within the printed document and (2) a fragment of the message, wherein a known mapping exists between the position of each fragment and the corresponding absolute location;

1 an image analyzer coupled to the image sensor to determine relative motion of the
2 image sensor and extract absolute locations and fragments of the message from the
3 images; and

4 a computing module that extracts the message from the fragments using the
5 known mapping and performs a predefined action in response to the message and at least
6 one of (1) the relative motion of the image sensor and (2) the absolute locations within the
7 printed document.

8 16. The system as recited in claim 15, wherein the message is of variable size.

9 17. The system as recited in claim 15, wherein the printed document is
10 selected from a group comprising a map, a calendar page, a catalog, a customer list, and
11 an index.

12 18. The system as recited in claim 15, wherein the predefined action is
13 selected from at least one of the following:

14 retrieving information from an information store;

15 changing the internal state of the computing module;

16 storing information in an information store; and

17 retrieving and executing a macro, wherein the macro comprises a sequence of
18 processing instructions which uses at least one of the absolute locations, the relative
19 location, and the internal state of the computing device.

20 19. The system as recited in claim 15, wherein the image analyzer determines
21 the relative motion of the image sensor by measuring changes in successive images such
22 that the relative motion can still be extracted even when the image sensor is not over the
23 printed document.

24 20. The system as recited in claim 15, wherein the encoded message further
25 comprises security information, and wherein the predefined action is authenticated using
26 the security information before being performed.

27 21. The system as recited in claim 15, further comprising at least one output
28 device for showing results or side-effects of performing the predefined action, wherein
29 each of the at least one output device is one of a type selected from the group consisting
30 of a printer, visual display, audio device, audio-visual device, and multi-media device.

22. The system as described in claim 21, wherein at least one output device is a visual display, and the image sensor and visual display are integrated as one physical unit, thereby allowing the display to appear as a window over the printed document.

23. The system as described in claim 22, wherein each pixel on the visual display is either transparent or opaque, and computer-controlled.

24. The system as recited in claim 21, wherein at least one output device is a print-head, and the image sensor and print-head are integrated as one physical unit, thereby allowing the print-head to leave marks, under computer control, on a surface being scanned by the image sensor.

25. The system as recited in claim 15 wherein a zoom factor is used to modify the relative motion of the image sensor.

26. A method for using a printed document encoded with a message, comprising:

collecting images of portions of the printed document by an image sensor, each portion being encoded with (1) an absolute location within the printed document and (2) a fragment of the message, wherein a known mapping exists between the position of each fragment and the corresponding absolute location;

determining relative motion of the image sensor;

extracting absolute locations and fragments of the message from the images;

reconstructing the message from the fragments using the known mapping; and

performing a predefined action in response to the message and at least one of (1) the relative motion of the image sensor and (2) the absolute locations within the printed document.

27. The method as recited in claim 26, wherein the message is of variable size.

28. The method as recited in claim 26, wherein the predefined action is selected from at least one of the following:

retrieving information from an information store;

changing the internal state of the computing module;

storing information in an information store; and

1 retrieving and executing a macro, wherein the macro comprises a sequence of
2 processing instructions which uses at least one of the absolute locations, the relative
3 location, and the internal state of the computing device.

4 29. The method as recited in claim 28, wherein changes to the internal state of
5 the computing module are indicated by entering input using a user interface, the user
6 interface being in communication with the movable device, the changes to the internal
7 state thereby influencing performance of subsequent actions.

8 30. The method as recited in claim 28, further comprising:

9 extracting an identifier from the encoded message; and

10 recording the identifier and corresponding usage information in the information
11 store, wherein the corresponding usage information comprise at least one of a device
12 identifier for the image sensor, an identifier for a user of the image sensor, a description
13 of the predefined action to be performed, and a time at which the predefined action is
14 performed.

15 31. The method as recited in claim 30, wherein information extracted from the
16 information store is further based on the extracted identifier.

17 32. The method as recited in claim 26, wherein determining relative motion of
18 the image sensor further comprises measuring changes in successive images such that
19 relative motion can still be extracted even when the image sensor is not over the printed
20 document.

21 33. The method as recited in claim 26, wherein the encoded message further
22 comprises security information, and wherein the step of performing the predefined action
23 is preceded by a step of authenticating the predefined action using the security
24 information.

25 34. The method as recited in claim 26, further comprising showing results or
26 side-effects of performing the predefined action on at least one output device, wherein
27 each of the at least one output device is one of a type selected from the group consisting
28 of a printer, visual display, audio device, audio-visual device, and multi-media device.

29 35. A method for monitoring the use of printed documents, said method
30 comprising steps of:

31 encoding a customer identification mark on a printed document, the printed
32 document being further encoded with fragments of a message distributed across a

1 plurality of locations on the printed document, the fragments being correlated with an
2 encoded absolute location within the printed document; and
3 determining identification of the image sensor from which a request for
4 information is originated, the information request being determined by a scanning of a
5 portion of the printed document by an image sensor, the image sensor determining a
6 relative location on the portion of the printed document corresponding to relative motion
7 of the image sensor, and the requested information being related to the scanned portion of
8 the printed document.

9 36. The method as recited in claim 35, further comprising the step of
10 correlating the identification of the image sensor with a corresponding user.

11 37. The method as recited in claim 36, further comprising assembling the
12 requested related information based on the corresponding user.

13 38. The method as recited in claim 37, further comprising sending the
14 corresponding user the requested related information..

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